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DESIGN AND IMPLEMENTATION OF UNASSOCIATED OBJECT INTELLIGENT ANALYZER FOR VIDEO SURVEILLANCE

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ABSTRACT

Video surveillance is an important aspect to any retail operation's loss avoidance approach. A major drawback in loss avoidance techniques today is that analog video equipment cannot detect criminal behavior and alert personnel. One has to constantly keep a watch on monitors – or later has to go through long video records to find a particular incident. Sometimes the poor quality of video also hurts effectiveness. The regular improvement in image processing technology is video surveillance applications. Technology for detecting unassociated objects in consumer world like airports, railways stations, shopping malls has resulted in commercialization and has won worldwide international awards. However, the requirement of a consumer video application is more than ever for an automated surveillance system. This paper propose an intelligent analyzer for semantic analysis of unattended objects in relation with human behaviors from a monocular surveillance video which is taken by a consumer camera from cluttered environments.

KEYWORDS: Consumer Video Surveillance, Intelligent Analyzer, Unattended Object, Multiple Background Model

INTRODUCTION

Consumer surveillance cameras are of very low cost and everywhere. The rise of smart cameras with higher processing abilities has made the idea of video surveillance systems possible which can provide the safety of people in the home and in public places such as shopping malls, railways stations, airports and etc. Terrorist attacks have become a major threat of public safety; like explosive attacks with unassociated packages on public places. A key function in such a surveillance system is the understanding of human behavior in relation with unassociated objects in public places.

This approach is based on an adaptive statistical sequential analysis method and a background modeling technique. For background modeling, periodic Markov chain theory concept is used producing a new background subtraction method. We then develop an object classification algorithm which can classify the objects as stationary or dynamic and also eliminate the unnecessary examination tasks of the entire background regions.

Finally, introduces a sequential analysis model based on exponent running average measure to analyze object involved events whether it is either abandoned or very still person. To confirm our proposed method we present some experimental results tested on our own video sequences taken in international airports and some public areas in a big city. The results found are very promising in terms of robustness and effectiveness.

Now with the regular improvement in image processing technologies, video camera surveillance is emerging for consumer's applications. The new technology for detecting unassociated object in consumer world like railway stations, shopping malls, crowded area and airports has resulted in commercialization, and has won the international awards.

However, the need of a consumer video application is more than ever for an automated surveillance system. We propose an intelligent analyzer for semantic analysis of objects left unattended in relation with human behaviors from a monocular surveillance video taken by a camera from cluttered environments. Our intelligent analyzer use cues to detect unassociated objects which are usually considered as security threat to public safety from terrorist explosive attacks.

Visual surveillance for human-behavior understanding has been investigated worldwide as a research topic [1]. In these systems, it should be a sufficiently high accuracy enabling a real-time performance. Thus, a prime goal of automated video surveillance is to obtain a live description of happening's in a monitored area and take appropriate action. Not always appreciated is that visual tasks people find straightforward can sometimes represent major challenges for the computer. The computational effort and complexity involved in simply "following" someone through an extended video sequence is enormous, and a truly robust and reliable tracker has yet to be developed. Compounding the problem is that usually public areas under surveillance often have fluctuating and variable lighting conditions, people are frequently occluded by other people or structures, and people may temporarily leave a monitored area, etc.

LITERATURE REVIEW

This paper [1], Many approaches have been attempted based on background subtraction were proposed [2] [8]. Such methods differ mainly in the type of background model and in the procedure used to update the model.

While in paper [2], a mixture of Gaussian distributions has been used for modeling the pixel intensities in[3], [4].

In [5] the authors proposed a simple background subtraction method based on logarithmic intensities of pixels. They claimed to have results that are superior to traditional difference algorithms and which make the problem of threshold selection less critical.

In [6] a prediction-based online method form modeling dynamic scenes is proposed. The approach seems to work well, although it needs a supervised training procedure for the background modeling, and requires hundreds of images without moving objects.

Adaptive Kernel density estimation is used in [7] for a motion-based back-ground subtraction algorithm, the detection of moving objects to handle complex background, but the computational costs is relatively high.

In [8] the spatial and temporal features incorporated in a Bayesian framework which characterizes the background appearance at each pixel. Their method seems to work well in the presence of both static and dynamic backgrounds.

In paper [4], Although many researchers focus on the background subtraction, few papers can be found in the literature for foreground analysis [9],. Reference [10] analyzed the foreground as moving object, ghost, and shadow by combining the motion information. The computation cost is expensive for real-time video surveillance systems because of the computation of optical f low.

In [10] they describe a background subtraction system to detect moving objects in a wide variety of conditions, and another system to detect objects moving in front of moving back-grounds. In their work, a gradient-based method is applied to the static or ground regions to detect the type of the static regions as unattended or removed objects (ghosts). It does this by analyzing the change in the amount of edge energy associated with the boundaries of the static.

PROPOSED WORK

The proposed system includes three processing steps:

- **Object Extraction:** - It involves a background subtraction algorithm that is based on combining periodic background models with quick lighting change adaptation and shadow removal.
- **Extracted Objects:** - Classified as dynamic or stationary objects, and
- **Classified Objects:** - Investigation by running mean about the static foreground masks for making the decision about event. We will use real- time video surveillance automated system for public safety and security applications [1]. It is a multi-level event-analysis system which consists of three conceptual components, each being briefly explained below.

Preprocessing

The periodic background modeling along with moving object detection and stochastic likelihood image are realized. Each image within the video covering an individual human body and static objects are segmented to extract the „blobs" representing foreground objects. In this processing, the periodic concept based background with periods of Short Length (SL) and Long Length (LL) are automatically built and updated by temporal statistical analysis.

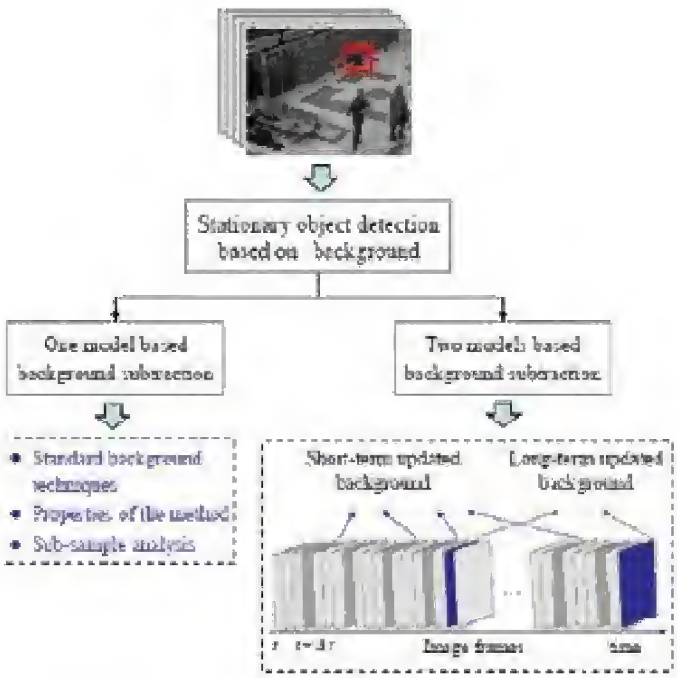

Figure 1: Stationary Foreground Detection Methods Based on Background Subtraction Techniques

The main motivation is that the recently changed pixels that stay static after they changed can be distinguished from the actual background pixels and the pixels corresponding to the moving regions by analyzing the intensity variance in different temporal scales. We employ the mixture of the periodic models along with Stochastically Varied (SV) likelihood image background and update them based on stable history maps and difference history maps. After motion detection, a shadow removing procedure is performed on each image in order to discard shadow points that, generally, deform the shape of the moving objects. To make algorithm working for quick lighting changes the intensity and texture information are integrated to remove shadows.

- **Stationary Object Detection Processes**

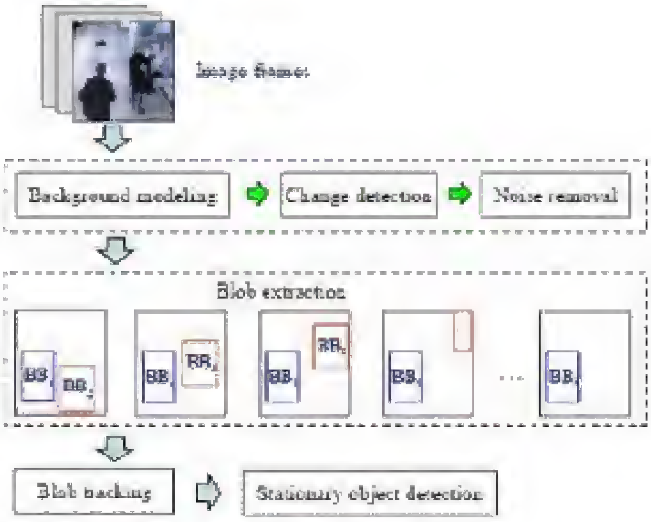

Figure 2: Stationary Foreground Detection Methods Based on Background Subtraction Techniques

A matching algorithm is employed to detect if the object is unattended long enough to trigger the alert. Moreover a mixture of multiple statistical models is used to analyze the foreground as moving objects, unattended objects, or removed objects (ghosts), and still person while detecting the backgrounds. Different thresholds are used to obtain the foreground mask (for moving objects) and the static region mask (for stationary objects).

- **Classifying Process for Object Type**

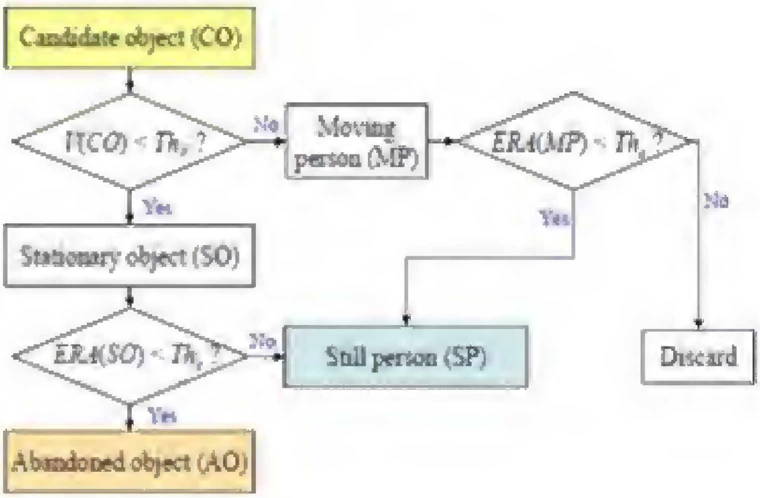

Figure 3: Object Classification of Extracted Foreground

For the stationary region mask, a segmentation method is developed to detect the type of the static region, significantly outperforming previous techniques. Only those attended/removed objects that meet the user defined alert requirements will trigger the alerts. With the method proposed in this paper, our system can be more robust to illumination changes and dynamic background, and it can also work very well even if the images of the video are in low quality. In addition, the rule based classification is used to distinguish the unattended object and the still-standing persons, which is a problem that is not solved in previous approaches

CONCLUSIONS

We have presented a efficient and robust computation method to detect abandoned object in public areas. This method uses three backgrounds that are learned by processing the input video at different frame rates. After the detection of foreground regions, a shadow re-moving algorithm has been implemented in order to clean the real shape of the detected objects. The object detection method works surprisingly well in crowded environments and can handle with illustration changes. It can also detect the very small abandoned objects contained in low quality videos. Due to its simplicity the computational effort is kept low and no training steps are needed. Finally, we can discriminate effectively between abandoned or still person by using a simple rule-based algorithm. The reliability of the proposed framework is shown by the experimental tests performed in big public transportation areas.

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